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(54) Currency handling apparatus

(57) A method of setting float levels for subsequent use in a currency handling apparatus for dispensing currency units from a plurality of stores, the method comprising:

manually adding or subtracting currency units to the or each store; and
memorising the altered levels as new float levels for subsequent use.

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Description

[0001] This invention relates to apparatus for handling units of currency. The invention will be described mainly in the context of coin handling, but is also applicable to apparatus which also or alternatively handles other units of currency, such as banknotes, smart cards, payment cards or the like.

[0002] It is known to provide a coin handling apparatus which receives and validates coins of different denominations, and directs valid coins to respective containers each containing coins of a single denomination. It is also known to dispense coins from these containers as change in an amount corresponding to the difference between the value of inserted coins and the price of a product or service obtained from a machine associated with the coin handling apparatus.

[0003] It is also known to arrange for the level of coins in each container not to exceed a predetermined upper level. The apparatus would thus tend to direct coins of a particular denomination to an associated container until the upper level is reached, and then any further coins of the same denomination would be sent to a cashbox, which would normally be of a type which does not permit the dispensing of coins therefrom.

[0004] Periodically, an operator will empty the cashbox. At this time, it is common for operators to adjust the levels of coins in the coin containers so that each one will contain a number of coins corresponding to a so called "float" level for the respective container in an attempt to ensure that there is usually an adequate supply of coins in the container to be used as change if this is necessary.

[0005] GB 2269256 discusses uses of float levels.

[0006] At present, the float level for each coin tube is set by a programming operation, which involves the person concerned entering a number of commands to reach an appropriate menu; then entering a number for the number of coins constituting the float level in the first tube; then entering a number for the second tube; and so on.

[0007] However, this operation has proved not to be very intuitive, because there is a relationship between the number of coins and the thickness of the coins, which varies with their denomination. The present applicant has realised that it would be convenient to the operator to set float levels in terms of a fraction of the total tube height, for example.

[0008] In US4883158, it is proposed to allow the user to insert a number of coins into each tube, and then press a button to cause memorisation of the number of coins deposited as the new float level.

[0009] However, this method would suffer the same drawback as the standard method, since the operator needs to count the number of coins inserted, and the number does not relate to the fraction of the total tube height of a tube due to the differing thickness of different denominations of coins.

[0010] Accordingly, the present invention provides a method of setting float levels for subsequent use in a currency handling apparatus for dispensing currency units from a plurality of stores, the method comprising: manually adding or subtracting currency units to the or each store; and memorising the altered levels as new float levels for subsequent use.

[0011] Thus, it is possible for a relatively unskilled operative to adjust the height of each tube to the desired level by eye, and then permit the mechanism to memorise the tube level (as opposed simply to the number of coins added).

[0012] Preferably, this is achieved by providing a current tube count and then counting the numbers of coins added or subtracted from each tube, by the user, and then adding these to the current count, to determine the fullness of the tube. This avoids the needs for additional sensors.

[0013] Other aspects and preferred embodiments of the invention, with corresponding advantages, will be apparent from the following description and claims.

[0014] An example of an apparatus in accordance with the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a schematic diagram of the mechanical part of a coin handling apparatus;

Fig. 2 is a block diagram of the circuit of the coin handling apparatus;

Fig. 3 is a perspective view showing a cassette of coin tubes which may be used in the present invention; and

Fig. 4 is a flow diagram showing schematically the operation of an embodiment of the present invention.

[0015] Referring to Fig. 1, the coin handling apparatus 2 in the vending machine includes a coin validator 4 for receiving coins as indicated at 6. During the passage of the coins 6 along a path 8 in the validator 4, the validator provides signals indicating whether the coins are acceptable, and if so the denomination of the coins. Various types of validators are known, including validators using optical, acoustic and inductive techniques. Examples of such validators are described in, amongst others, GB 1397083, GB 1443934, GB 2254948, GB 2094008 and GB 2288266, the contents of which documents are incorporated herein by reference.

[0016] Acceptable coins then enter a coin separator 10, which has a number of gates (not shown) controlled by the circuitry of the apparatus for selectively diverting the coins from a main path 12 into any of a number of further paths 14, 15, 16 and 17, or allowing the coins to proceed along the path 12 to a path 20 leading to a cashbox 21. If the coins are unacceptable, instead of entering the separator 10 they are led straight to a reject slot via a path 30.

[0017] Each of the paths 14, 15, 16 and 17 leads to

a respective one of four coin tubes or containers 22, 24 and 26 and 28. Each of these containers is arranged to store a vertical stack of coins of a particular denomination. Although only four containers are shown, any number may be provided.

[0018] A dispenser indicated schematically at 29 is operable to dispense coins from the containers when change is to be given by the apparatus. The dispensed coins are delivered to a refund path 31.

[0019] As shown in Fig. 3, the tubes 22, 24, 26, 28 are provided in a removable cassette 40, and the tubes themselves are removable from the cassette, as described in GB 2246897 A, the contents of which are incorporated herein by reference.

[0020] Referring to Fig. 2, the circuit of the present embodiment of the invention incorporates a microprocessor 50 connected to data and address buses 52 and 54. Although separate buses are shown, data and address signals could instead be multiplexed on a single bus. A bus for control signals could also be provided. An LSI could replace the microprocessor.

[0021] The microprocessor 50 is connected via the buses 52 and 54 to a read-only memory (ROM) 56 and a random access memory (RAM) 58. The ROM 56 stores the program controlling the overall operation of the microprocessor 50, and the RAM 58 is used by the microprocessor 50 as a scratch-pad memory.

[0022] The microprocessor 50, the ROM 56 and the RAM 58 are, in the preferred embodiment, combined on a single integrated circuit.

[0023] The microprocessor 50 may also be connected via the buses 52 and 54 to an EAROM 60 for storing a variety of alterable parameters.

[0024] The microprocessor 50 is also coupled via the buses 52 and 54 to input/output circuitry indicated at 62. The circuitry 62 includes user-operable switches, at least one level sensor for each of the coin containers 22, 24, 26, 28, circuits for operating the dispenser 29 and the gates of the coin separator 10, the circuitry of the coin validator 4, and a display visible to a user of the apparatus for displaying an accumulated credit value and an indication when insufficient coins are stored to guarantee that change will be available. The circuitry 62 is connected to a display 68 visible to the operator, and to a keypad 70 accessible only to the operator.

[0025] The input/output circuitry 62 also includes an interface between the control circuit of the apparatus and a vending machine circuit board 64 to which it is connected, and a further interface to an audit device 66.

[0026] In operation of the apparatus the microprocessor 50 successively tests the signals from the validator to determine whether a coin has been inserted in the apparatus. When a credit has been accumulated, the microprocessor also tests signals from the vending machine to determine whether a vending operation has been carried out. In response to various signals received by the microprocessor 50, various parts of the program stored in the ROM 56 are carried out. The microprocessor is thus arranged to operate and receive signals from the level sensors of the coin containers 22, 24, 26, 28, and to control the gates in the separator 10 in order to deliver the coins to the required locations, and is also operable to cause appropriate information to be shown on the displays of the apparatus and to deliver signals to the vending machine to permit or prevent vending operations. The microprocessor is also operable to control the dispenser to deliver appropriate amounts of change.

[0027] The microprocessor 50 is arranged to maintain a count of the number of coins in each of the tubes, by keeping for each tube a running total, and incrementing the running total each time a coin of a particular denomination is accepted and routed to the tube in question; and decrementing the running total each time a coin of a particular denomination is dispensed, as disclosed in GB 2110862 (incorporated herein by reference).

[0028] The arrangement so far is quite conventional, and the details of particular structures suitable for using as various parts of the mechanism will therefore not be described in detail.

[0029] The particular sequence of most of the operations carried out by the microprocessor may be the same as in previous apparatus. A suitable program to be stored in the ROM 56 can therefore be designed by anyone familiar with the art, and accordingly only the operations carried out by the particularly relevant parts of this program will be described.

[0030] In this embodiment, conveniently, the keypad 70 comprises 4 keys (labelled "A" to "D") for data entry, and a control key. Although not shown, these will be referred to respectively as keys 71 to 74, and key 75.

[0031] To reset the float levels, the operative uses a security key to open the vending machine, thus gaining access to the coin mechanism, and uses the keypad 70 to enter a security code to gain access to the functions of the coin mechanism. The program performed thereafter will now be disclosed with reference to Fig. 4.

[0032] Initially, the mechanism is put into a float level setting mode by a predetermined string of key presses.

[0033] On entering this mode, the microprocessor 50 is arranged to perform the functions of coin validation (that is, acceptance and recognition of coins and routing thereof to the correct coin tubes) and manually actuated coin dispensing. In the latter case, one of each of the four buttons 71-74 is associated by the microprocessor with one of each of the four tubes 22-28, so that depression of the respective button 71-74 causes a dispense from the corresponding tube 22-28.

[0034] In step 102, the microprocessor 50 determines whether a coin has been accepted through the validator 4 (for example in response to operation of the gates of the coin separator 10). If a coin has been accepted, then in step 104, the microprocessor 50 reads the denomination of the coin (more particularly,

determines the coin tube to which the coin is to be routed by the settings of the coin separator 10).

[0035] In step 106, the current coin count for the tube concerned is read (i.e. the running total specifying the number of coins recorded as being present in the tube) and in step 108, that number is incremented by the microprocessor 50.

[0036] In step 110, the microprocessor determines whether a stop code has been entered (e.g. by holding down key 75 for a predetermined period of time) indicating that the float setting operation is to cease and, if no such code is entered, returns to step 102.

[0037] If, in step 102, no coin has been entered, the microprocessor 50 determines whether one of the buttons 71-74 has been pressed indicating a dispense operation (and, if so, dispenses a corresponding coin).

[0038] In step 114, the identity of the key pressed is determined, and the corresponding tube (i.e. coin denomination) is determined.

[0039] In step 116, the current running total number of coins for that tube is read, and in step 118, the total is decremented, to take account of the dispensed coin. Then, the microprocessor performs step 110 as described above.

[0040] When the operator enters the predetermined code or sequence on key 75, this is detected in step 110, and the microprocessor proceeds to step 120, in which the current running totals for each denomination (i.e. tube) are stored as new float levels, which are used in all subsequent operations, and subsequently exits the float level setting program.

[0041] Thus, a relatively unskilled operative can reset the float levels as desired, for example, by applying a ruler horizontally across the transparent outer face of the cassette 40; and dropping coins of each denomination into, or dispensing coins out from, each tube until the level in each tube reaches that of the ruler. This makes it easy to set the float levels to any desired global level; for example, one third, half, or three quarters full, without performing a complex calculation as to the number of coins required (taking into account the different coin thicknesses) to fill each tube to this height and then entering numeric data.

Other Variants And Modifications

[0042] It will be apparent that the present invention is not limited to the foregoing embodiments. For example, it could be performed with a last in, first out store as described in WO 94/28520. In this case, the number of coins may be counted by the method disclosed therein, which is incorporated herein by reference.

[0043] Equally, the number of coins input during setting the float levels may be determined by providing sensors to determine the stack height; for example using acoustic sensing as in US 5092816.

[0044] Various other modifications will be apparent to the person skilled in the art, and the invention is not limited to the specific examples described above.

Claims

1. A method of setting float levels for subsequent use in a currency handling apparatus for dispensing currency units from a plurality of stores, the method comprising:

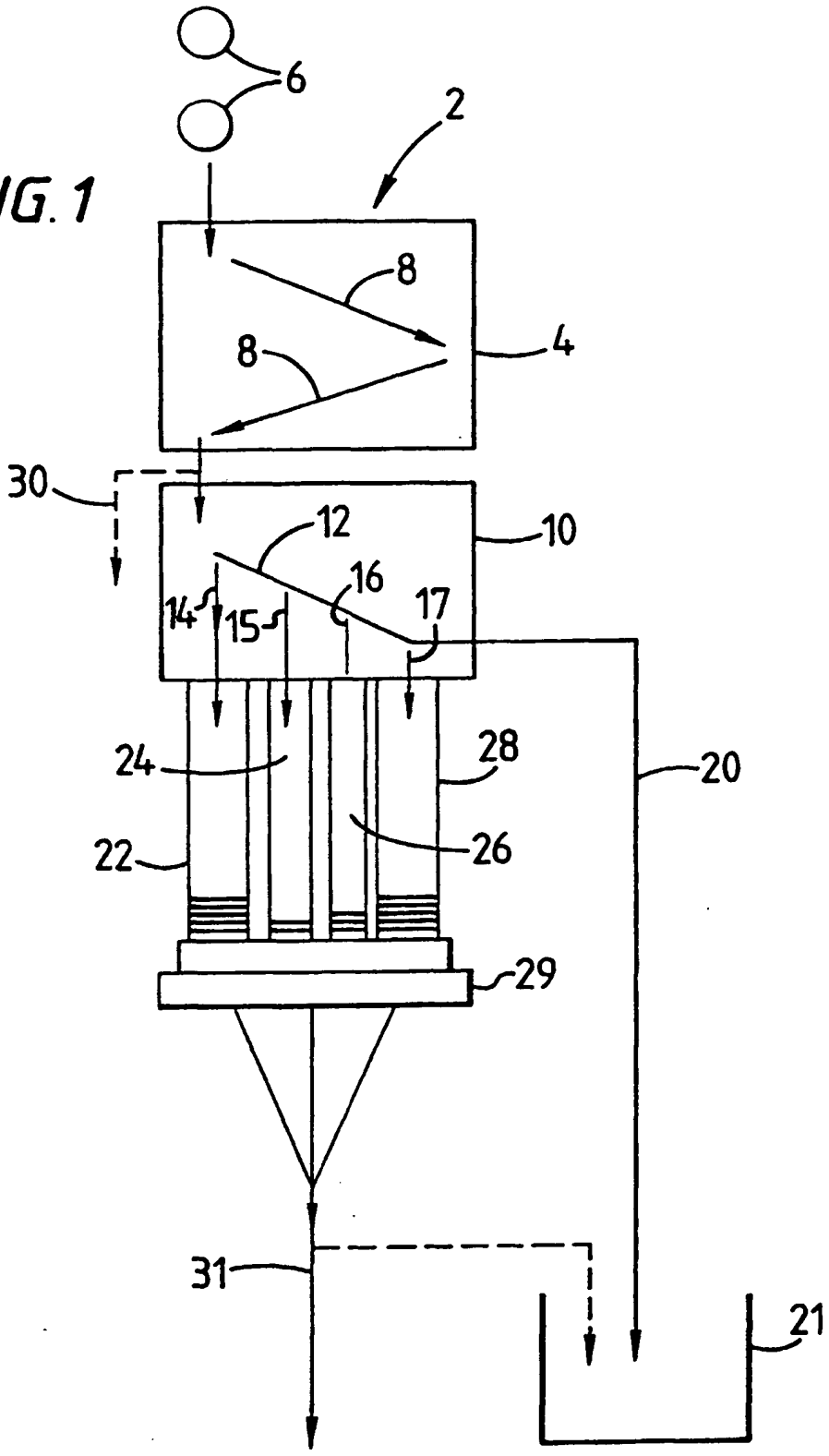
   manually adding or subtracting currency units to the or each store; and
   memorising the altered levels as new float levels for subsequent use.

2. The method of claim 1, in which said step of adding coins comprises inserting coins into a coin validator of said mechanism, and further comprises the step of recognising the denomination of said coins and routing them to respective said containers.

3. The method of claim 1 or claim 2, further comprising maintaining a running total of currency units in each said container, and varying said running total with the addition or removal of currency units.

4. A currency handling apparatus comprising a plurality of stores and means for dispensing currency units therefrom, further comprising means for memorising a float level for each said store, and means for setting said float level using the method of any preceding claim.

FIG. 1



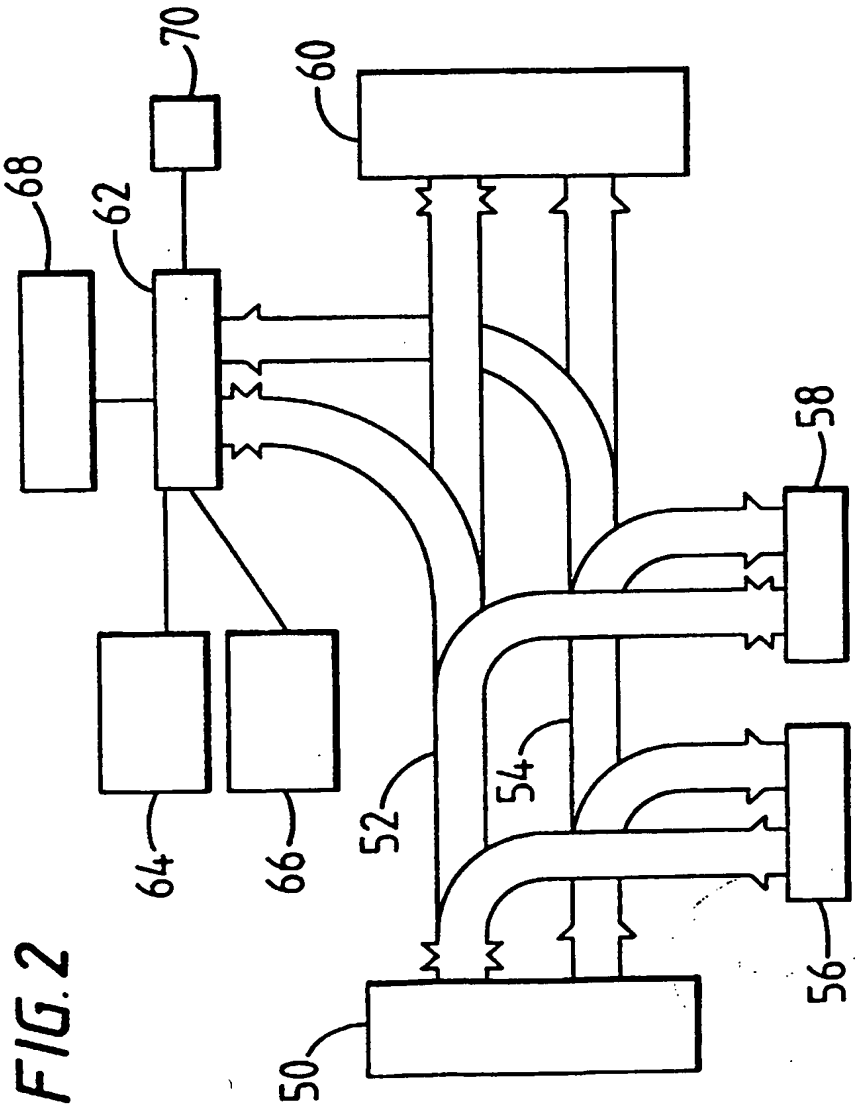


FIG. 2

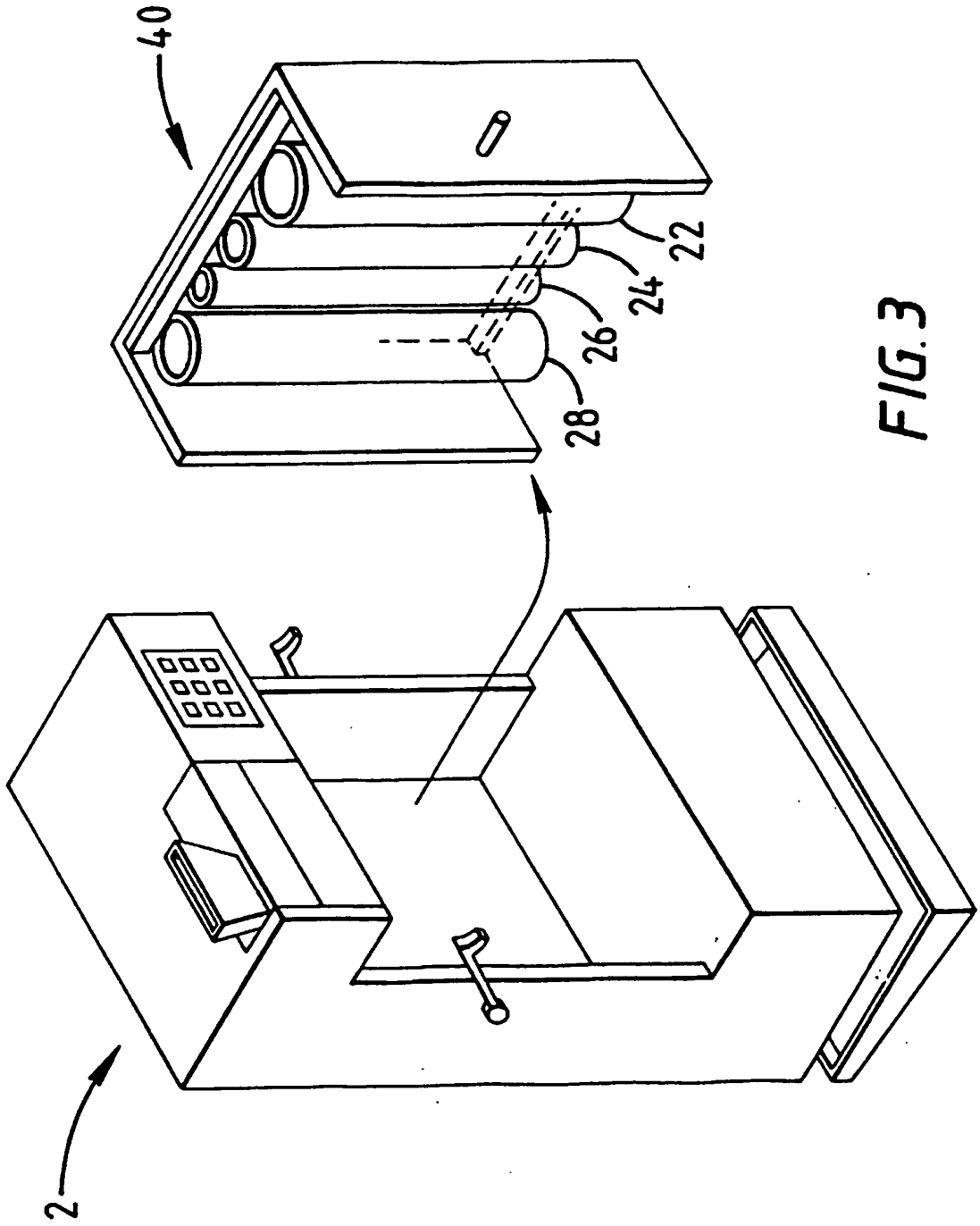


FIG.3

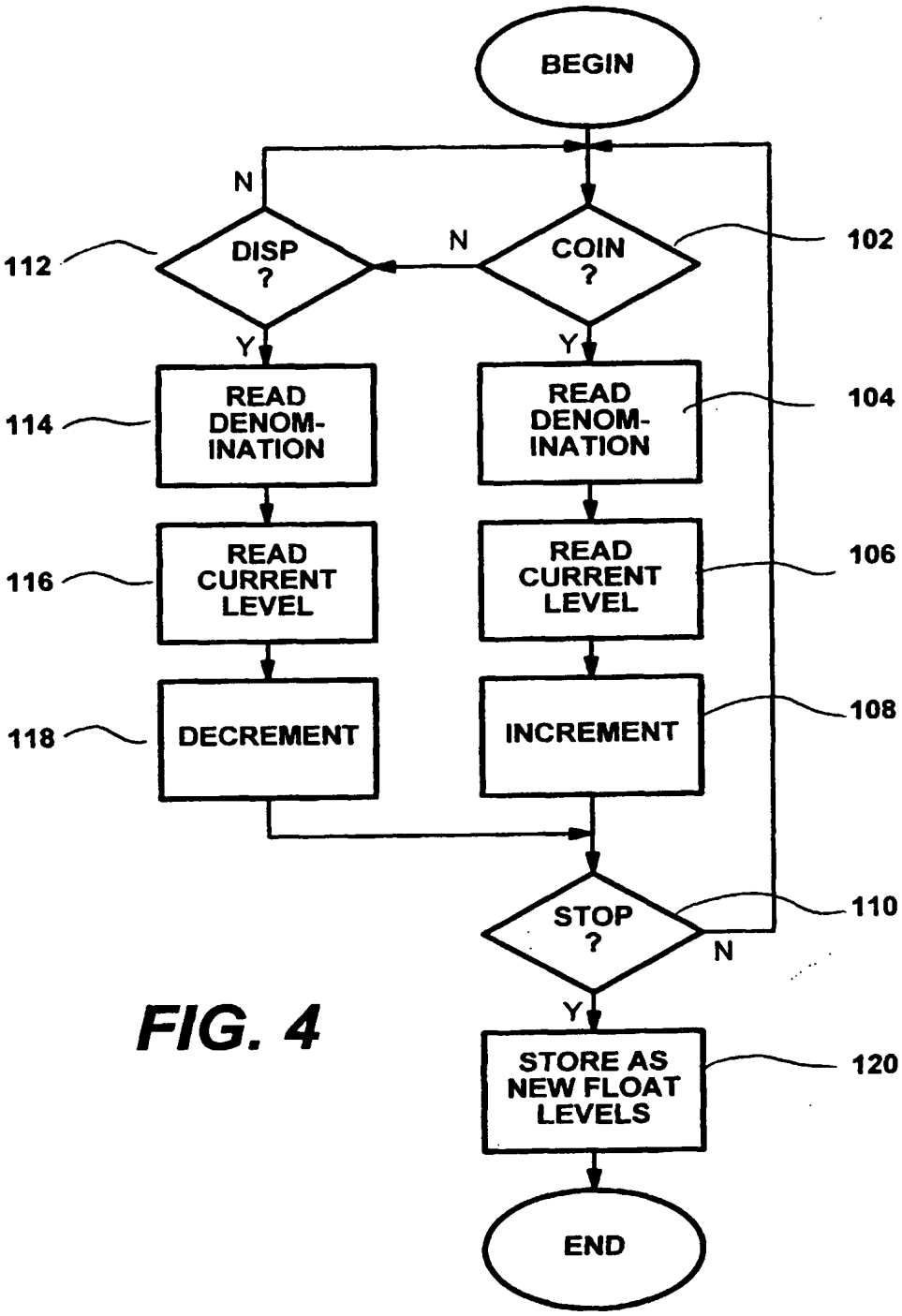

BEGIN
N
112
DISP ?
N
COIN ?
102
Y
Y
114
READ DENOM-INATION
READ DENOM-INATION
104
116
READ CURRENT LEVEL
READ CURRENT LEVEL
106
118
DECREMENT
INCREMENT
108
STOP ?
110
N
Y
STORE AS NEW FLOAT LEVELS
120
END

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 1462

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

G07D
G07F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 May 2000	Lindholm, A-M

CATEGORY OF CITED DOCUMENTS

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31-05-2000

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